

Claims

1. An enzyme catalysing in an acyl-CoA-independent reaction the transfer of fatty acids from phospholipids to diacylglycerol in the biosynthetic pathway for the production of triacylglycerol.  
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2. An enzyme according to claim 1, comprising an amino acid sequence as set forth in SEQ ID No. 2 or a functional fragment, derivate, allele, homologue or isoenzyme thereof.  
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3. An enzyme according to claims 1 or 2 designated as phospholipid:diacylglycerol acyltransferase (PDAT).  
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4. An enzyme according to claims 1 to 3, comprising an amino acid sequence as set forth in SEQ ID No. 1a, 2b or 5a or a functional fragment, derivate, allele, homologue or isoenzyme thereof.  
a  
c  
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5. An enzyme according to claims 1 to 4, comprising an amino acid sequence selected from the group consisting of sequences as set forth in SEQ ID No. 2a, 3a, 5b, 6, 7b, 8, 13, 14, 15 or a functional fragment, derivate, allele, homologue or isoenzyme thereof.  
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6. An enzyme according to claims 1 to 5, comprising an amino acid sequence encoded through a nucleotide sequence, a portion, derivate, allele or homologue thereof selected from the group consisting of sequences as set forth in SEQ ID No. 1, 1b, 3, 3b, 4, 4a, 4b, 5, 5b, 6b, 7, 8b, 9, 9b, 10, 10b, 25 11, 11b, 12 or a functional fragment, derivate, allele, homologue or isoenzyme of the enzyme encoding amino acid sequence.  
a  
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7. A nucleotide sequence encoding an enzyme catalysing in an acyl-CoA-independent reaction the transfer of fatty acids from phospholipids to  
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diacylglycerol in the biosynthetic pathway for the production of triacylglycerol.

8. A nucleotide sequence according to claim 7 encoding an enzyme  
5 designated as phospholipid:diacylglycerol acyltransferase (PDAT).

9. A nucleotide sequence according to claims 7 or 8, selected from the group consisting of sequences as set forth in SEQ ID No. 1, 1b, 3, 3b, 4, 4a, 4b,  
10 9b, 10, 10b or 11 or a portion, derivate, allele or homologue thereof.

10. A partial nucleotide sequence corresponding to a fulllength nucleotide sequence according to claims 7 to 9, selected from the group consisting of sequences as set forth in SEQ ID No. 5, 5b, 6b, 7, 8b, 9, 11b or 12 or a portion, derivate, allele or homologue thereof.  
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11. A nucleotide sequence according to claims 7 to 10, comprising a nucleotide sequence which is at least 40% homologous to a nucleotide sequence selected form the group consisting of those sequences set forth in SEQ ID No. 1, 1b, 3, 3b, 4, 4a, 4b, 5, 5b, 6b, 7, 8b, 9, 9b, 10, 10b, 11, 11b or 12.  
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12. A gene construct comprising a nucleotide sequence according to claims 7 to 11 operably linked to a heterologous nucleic acid.  
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13. A vector comprising a nucleotide sequence according to claims 7 to 11 or a gene construct according to claim 12.

14. A vector according to claim 13, which is an expression vector.

20 15. A vector according to claims 13 or 14, further comprising a selectable marker gene and/or nucleotide sequences for the replication in a host cell or the integration into the genome of the host cell.

*Sub 18*  
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16. A transgenic cell or organism containing a nucleotide sequence according to claims 7 to 14 and/or a gene construct according to claim 12 and/or a vector according to claims 13 to 15.

17. A transgenic cell or organism according to claim 16 which is an eucaryotic cell or organism.

a 18. A transgenic cell or organism according to claims 16 or 17 which is a yeast cell or a plant cell or a plant.

a 19. A transgenic cell or organism according to claims 16 to 18 having an altered biosynthetic pathway for the production of triacylglycerol.

a 15 20. A transgenic cell or organism according to claims 16 to 19 having an altered oil content.

a 21. A transgenic cell or organism according to claims 16 to 20 wherein the activity of PDAT is altered.

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a 22. A transgenic cell or organism according to claims 16 to 21 wherein the altered activity of PDAT is characterized by an alteration in gene expression, catalytic activity and/or regulation of activity of the enzyme.

a 25 23. A transgenic cell or organism according to claims 16 to 22 wherein the altered biosynthetic pathway for the production of triacylglycerol is characterized by the prevention of accumulation of undesirable fatty acids in the membrane lipids.

30 24. A process for the production of triacylglycerol, comprising growing a transgenic cell or organism according to claims 16 to 23 under conditions

whereby the said nucleotide sequence according to claims 7 to 11 is expressed and whereby the said transgenic cells comprising an enzyme according to claims 1 to 6 catalysing the transfer of fatty acids from phospholipids to diacylglycerol forming triacylglycerol.

5 25. Triacylglycerols produced by a process according to claim 24. <sup>30</sup>

10 26. Use of a nucleotide sequence according to claims 7 to 11 and/or an enzyme according to claims 1 to 6 for the production of triacylglycerol and/or triacylglycerols with uncommon fatty acids.

15 27. Use of a nucleotide sequence according to claims 7 to 11 and/or an enzyme according to claims 1 to 6 for the transformation of any cell or organism in order to be expressed in this cell or organism and result in an altered, preferably increased oil content of this cell or organism.

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